CLAIMS

What is claimed is:

1. A method for the continuous non-thermal decomposition and pasteurization of industrial quantities of organic process material by electroporation, wherein the process material is carried through a reactor in, and with, a transport/processing liquid and is subjected therein to the effects of pulsed electric fields generated between grounded electrodes which are distributed over a longitudinal area of the reactor and electrode groups consisting each of at least one electrode which can be energized by a high voltage and are distributed over an opposite longitudinal area of the reactor, said method comprising the steps of:
generating pulse-like electric fields only between an electrode group and the grounded electrodes by discharging an electric energy source connected to the respective electrode group by way of an associated switch without time-overlap with the other electrode groups such that the field axes extending between one electrode group and the grounded electrodes do not extend normal to a longitudinal reactor axis,
charging the electric energy sources between two immediately successive discharges to such a level that, in the area between one electrode group and the nearest grounded electrode, an electric field strength E is generated during the discharge whereby along the longitudinal axes (z) of the cells of the process material which is momentarily present in this field area, for the duration of at most 1 μs, the threshold potential difference

$$\Delta\varphi_s = 10\ \mathrm{V}$$

is exceeded for the irreversible fracture and opening of the cell wall.

2. A method according to claim 1, wherein between two immediately successive discharges the electric energy sources are charged to such an extent that, in the area between an electrode group and at least the nearest grounded electrodes, an electric field strength E is generated during the discharge such that, along the longitudinal axis of the cells, that is the main axis (z), of the process material which is momentarily present in this field area, a potential difference of $\Delta\varphi \geq 100$ V is generated for a period of not more than 1 μs.

3. A method according to claim 2, wherein an electrode group including a Marx generator and a spark gap structure connected thereto are used, which are so dimensioned that the voltage increase to the voltage maximum of at most 1 MV takes not longer than 100 μsec.

4. A reactor for the continuous non-thermal decomposition and pasteurization of industrial amounts of organic process material by electroporation, wherein the process material consists of biological cells in plants, roots, fruits, and animal materials, said reactor comprising a process material transport path which, in the reactor area, is flooded by transport/process liquid which flows through the reactor and in which the process material is exposed to the effects of pulsed electric fields, said transport path including a tunnel-shaped section of a dielectric material, with grounded electrodes disposed in the reactor wall in a first longitudinal area extending over the length of the reactor and said electrodes having front areas which are exposed to the open space of the reactor,

electrodes disposed in a second longitudinal area of the reactor wall over the length of the reactor which can be charged by a high voltage and which have front areas which are exposed to the open space of the reactor,
said energizable electrodes being combined in electrode groups comprising each at least one electrode, and said groups being so arranged that the distance between these groups corresponds about to the inner open width (d) of the longitudinal area of the electrode groups, said energizable electrodes being separated from the longitudinal area including the grounded electrodes by a length area which does not include any electrodes, and, over the length of the reactor, has at least a width so selected that during processing no electrical discharge can occur between two different electrode groups, but the field strength of $\geq$ 10 kV/cm required for the electroporation can be established,
said longitudinal area with grounded electrodes being positioned relative to the energizable electrodes such that each straight line connection between a grounded electrode and an electrode group extends through said transport path of the reactor but never normal to the longitudinal axis of the transport path.

5. A reactor according to claim 4, wherein said energizable electrodes are arranged in groups of at least one electrode and each group is connected by way of a high voltage cable and a switch or spark gap with its own high voltage source or Marx generator.

6. A reactor according to claim 5, wherein the surface area of each electrode group which can be energized by a high voltage equals about the sum of the exposed surfaces of the nearest grounded electrodes.

7. A reactor according to claim 6, wherein the aspect ratio of electrode surface F to the distance d between the respective high voltage electrode and the nearest adjacent grounded electrodes does not exceed the value

$$F : d = \frac{1}{2}\ \mathrm{cm}$$

and does not exceed that value essentially when the next following grounded electrodes are taken into account.

8. A reactor according to claim 7, wherein the electrodes are so distributed over the respective longitudinal area that there is no electrode pair comprising a grounded electrode and an energizable electrode, whose straight line connection extends normal to the flow direction of the process material, that is normal to the material transport path through the reactor.

9. A reactor according to claim 8, wherein the electrode groups which can be energized by high voltage are so distributed that, in a projection normal to the axis of the material transport path through the reactor onto the longitudinal area including the grounded electrodes, no high voltage electrode group overlaps a grounded electrode.